UTILITY BRACKET

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FIELD OF THE INVENTION

This invention relates generally to support systems and, more specifically, to utility brackets for securing system components to a structure.

BACKGROUND OF THE INVENTION

Complex systems, such as electrical systems in aircraft, utilize numerous utility brackets for securing many parts, such as electrical wire bundles (FIGURE 1). Brackets are currently drilled and riveted to the aircraft structure (FIGURE 2). This process requires locating, clamping, drilling the bracket in place, and installing multiple rivets to attach the bracket. There currently exists an unmet need to reduce part count and installation labor costs.

FIGURE 3 illustrates an alternative apparatus to the bolted or riveted utility bracket. A utility bracket 30 is adhesively bonded to a structure 32. The bracket 30 is an improvement over the drilled and riveted bracket system shown in FIGURE 2, because the steps required to drill and rivet the bracket are not needed. A person mounting the bracket 30 to the structure 32 simply applies adhesive to the structure 32 or the surface of the bracket 30 that is to be mounted on the structure 32, and then mates the utility bracket 30 with the structure 32.

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However, if too much or not enough pressure is applied when mating the utility bracket 30 to the structure 32, the amount of adhesive applied may end up being too thin or too thick between the utility bracket 30 and the structure 32, thereby producing a less than adequate bond.

The utility bracket 30 utilizes a frame device (not shown) to alleviate this problem by supporting the utility bracket 30 after it is adhesively bonded with the structure 32. The frame device controls the adhesive bondline thickness between the utility bracket 30 and the structure 32, but adds an additional expense and requires the extra steps of installation prior to adhesive bonding, and then removing the frame device after the adhesive is cured. Also, the size of the frame device may limit the location freedom of the utility bracket 30 due to interference with nearby structure.

Therefore, there also currently exists an unmet need to quickly and effectively bond utility brackets to structures by controlling the adhesive bondline thickness, while closely replicating the size and function of the current mechanically attached bracket.

In addition, the current utility bracket is located in a fixed orientation that dictates the path of all connected components. If wire bundles are attached to the bracket, the wire bundles have a natural tendency to follow a specific path that could cause straining or over-bending of the wire bundles, which could occur because the utility bracket only allows a single axis of rotation. Thus, there currently remains an unmet need to design and manufacture a utility bracket that will swivel to provide multiple rotational axes, whereby components such as wire bundles can follow a general path without undue straining or over-bending.

SUMMARY OF THE INVENTION

The present invention provides a utility bracket for attaching wires or wire bundles to a structure, such as an aircraft. The present invention provides an easy to install bracket with known adhesive capabilities.

The utility bracket includes a first portion that supports a product and a second portion that adheres to a support structure. The second portion includes a separation component (geometric feature) that separates the second portion from the support structure by a predefined distance. The predefined distance is based on properties of an adhesive that is applied between the second portion and the support structure.

In one aspect of the invention, the separation component includes a plurality of ridges or dimples.

In another aspect of the invention, the second portion is a concave surface or an L-shaped surface.

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In a further aspect of the invention, a nut plate secures the product to the first portion.

In still another aspect of the invention, the second portion includes a base plate and the first portion is rotatably coupled to the base plate. The base plate includes a button and the first portion includes a component for receiving the button.

In still a further aspect of the invention, the bracket is formed by a molding or extruding process.

BRIEF DESCRIPTION OF THE DRAWINGS

The preferred and alternative embodiments of the present invention are described in detail below with reference to the following drawings.

FIGURE 1 is a perspective view of a prior art utility bracket application;

FIGURES 2 and 3 are side views of prior art utility bracket applications;

FIGURES 4 and 5 are perspective views of a bracket formed in accordance with the present invention;

FIGURE 6 is a side view of a bracket similar to the bracket shown in FIGURES 4 and 5;

FIGURE 7 illustrates a perspective view of a bracket formed in accordance with the present invention;

FIGURE 8 illustrates a side view of a portion of the bracket of FIGURE 7;

FIGURE 9 is a perspective view of the bracket of FIGURES 7 and 8 mounted to a structure and in support of the system component;

FIGURE 10 illustrates a perspective view of a bracket formed in accordance with the present invention;

FIGURE 11 illustrates a perspective view of the bracket of FIGURE 10 mounted to a structure and in support of a system component;

FIGURES 12 and 14 illustrate side views of various brackets mounted to a structure and formed in accordance with the present invention;

FIGURE 13 illustrates a perspective view of the bracket of FIGURE 12 as mounted to a structure and supporting a system component;

FIGURES 15 and 17 illustrate side views of a bracket mounted to a structure and formed in accordance with the present invention;

FIGURE 16 illustrates a perspective view of the bracket shown in FIGURE 15 as mounted to a structure and supporting system components;

FIGURE 18 illustrates an exploded view of a swivel bracket formed in accordance with the present invention;

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FIGURE 19 illustrates a perspective view of the bracket system shown in FIGURE 18;

FIGURE 20 illustrates a perspective view of a base of the swivel bracket shown in FIGURES 18 and 19; and

FIGURE 21 illustrates a perspective view of the swivel bracket of FIGURES 18-20 that is in support of a system component.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

The present invention provides a utility bracket and a method for attaching the utility bracket to a structure in order to provide a quick and effective bond. Referring now to FIGURES 4 and 5, perspective views of an exemplary utility bracket 50 formed in accordance with the present invention are shown. The utility bracket 50 is suitably formed of metal, molded polycarbonate, or some other substance of sufficient thickness to provide suitable rigidity. The utility bracket 50 is bent, extruded, or molded into an approximate L-shape pattern with or without supports as necessary. A section 54 of the utility bracket 50 is stamped or molded with one or more dimples 56. The dimples 56 protrude from the utility bracket 50 on a convex side of the bracket 50.

Referring now to FIGURE 6, the utility bracket 50 is attached to a support structure by mating the side where the dimples 56 protrude from the utility bracket 50 to the structure 60 after adhesive 62 has been applied to the support structure 60 or the utility bracket 50. The size of the dimples 56 is determined based on the amount of adhesive 62 that is desired between the utility bracket 50 and the support structure 60. The amount of desired adhesive is based on the type of adhesive (such as epoxies, acrylics, or polythioethers) and the recommended thickness to apply the adhesive and get the best bond. Thus, after the adhesive 62 has solidified or effected its bond between the utility bracket 50 and the support structure 60, the recommended thickness for the adhesive 62 will exist between the utility bracket 50 and the support structure 60 because of the size of the dimples 56.

Referring now to FIGURE 7, a bracket 80 formed in accordance with another embodiment of the present invention is shown. The utility bracket 80 includes first and second sides 82 and 84 that are connected to in an approximately parallel relationship to a base 86. A flange 88 extends from the base 86 and is approximately orthogonal to the first and second sides 82 and 84. The flange 88 includes one or more thru-holes 90 that are used for bolting on various items that the utility bracket 80 is designed to support, such as without limitation, a wire bundle clamp and holder (not shown). The first and second sides 82 and 84 include inward facing surfaces 92 and 94, respectively. Each of the inward facing surfaces 92

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and 94 include one or more ridges 98. The gap formed between the first and second sides 82 and 84 receives a support structure.

Referring now to FIGURE 8, a side view of a portion of the utility bracket 80 mounted to the support structure 60 is shown. The ridges 98, formed on the inward surfaces 92 and 94, are formed of a sufficient thickness or height to allow an adhesive layer of a proper thickness to be applied between the first and second sides 82 and 84 and the support structure 60. The interior of the cavity that receives the support structure 60 is curved at the point where the inward facing surfaces 92 and 94 meet with the base 86. The amount of curvature applied is determined based on an amount of gap desired between the base 86 and an end of the support structure 60. Thus, the curvature sets the gap to be approximately equal to the optimum thickness for the adhesive that will be applied between the support structure 60 and the utility bracket 80.

Referring now to FIGURE 9, the utility bracket 80 mounted and adhesively attached to the support structure 60 is shown. A nut plate attachment 104 is mounted through one of the thru-holes 90. A bolt (not shown) secures a clamp 106 to the nut plate attachment 104 and thus to the flange 88 of the utility bracket 80. In this example, the clamp 106 receives a wire bundle 108.

Referring now to FIGURE 10, a utility bracket 100 similar to the bracket 80 (FIGURE 7) is shown. The utility bracket 100 is roughly T-shaped with a stem 101 having a first side 102 with one or more ridges 114. A top portion 116 of the utility bracket 100 includes a first flange 118 that extends from the stem 101 from the first side 102. The first flange 118 extends a distance approximately equal to the thickness of a support structure that the utility bracket 100 will be adhered to. The top section 116 also includes a second flange 110 having one or more attachment holes 112.

Referring now to FIGURE 11, the utility bracket 100 adhered to the support structure 60 is shown. The flange 118 allows the utility bracket 100 to be quickly positioned on an edge of the frame structure 60. The ridges 114 maintain a gap between the utility bracket 100 and the support structure 60.

Referring now to FIGURES 12 and 13, a side-view of a utility bracket 120 that secures a clamp or sleeve device 122 to a support structure 60 is shown. The utility bracket 120 includes an attaching mechanism that is similar to that attaching the bracket 80 to the support structure 60 (FIGURES 7-9). The utility bracket 120 includes an end 124 having one or more thru-holes 126. One or more wire ties 130 or other securing mechanisms are received through the one or more thru-holes 126. An edge 136 of the utility bracket 120 opposite the portion that mounts to the support structure 60 is suitably curved to receive a

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clamp or sleeve 122. The wire ties 130 secure the clamp or sleeve device 122 to the edge 136. The edge 136 is formed with a similar radius of curvature as the clamp or sleeve device 122.

Referring now to FIGURE 14, a utility bracket 140 that is similar to the utility bracket 120 (FIGURE 12) is shown. The utility bracket 140 includes a similar structure that adheres the utility bracket 100 (FIGURE 10) to the support structure 60. Otherwise, the utility bracket 140 is similar to the utility bracket 120 (FIGURE 12).

Referring now to FIGURES 15 and 16, a utility bracket 150 similar to the utility bracket 120 (FIGURES 12 and 13) is shown. An end 152 of the utility bracket 150 that includes the thru-holes extends approximately orthogonal to a portion 156 of the utility bracket 150 that secures the utility bracket 150 to the support structure 60.

Referring now to FIGURE 17, a utility bracket 180 similar to the utility bracket 150 (FIGURES 15 and 16) is shown, except that the utility bracket 180 only includes a single leg 182 and a flange 184 for mating with the support structure 60 (see FIGURES 10 and 14).

Referring now to FIGURES 18 and 19, a swivel bracket system 200 is shown. The swivel bracket system 200 includes a base plate 204 and a utility bracket 206. The utility bracket 206 is suitably L-shaped and includes a receiving hole 210 on a first portion 212. A second portion 214 of the utility bracket 206 includes one or more thru-holes 216 for receiving support clamps (not shown). The base plate 204 includes a first surface 220 that is adhesively attached to a support structure (not shown). A second surface 224 opposite the first surface 220 includes a swivel button 226 mounted to approximately the center of the base plate 204. The swivel button 226 includes two or more flexible leaves 230 that are flanged at a height above the second surface 224 that is approximately equal to or slightly larger than the thickness of the first portion 212. The swivel button 226 is received through the receiving hole 210 into a convex side of the utility bracket 206. As the swivel button 226 is received through the receiving hole 210, the leaves 230 flex inward until the flanged portion of the swivel button 226 passes through the receiving hole 210. After the swivel button 226 has passed through the receiving hole 210, the leaves 230 maintain their natural at rest position which places the flanges of the leaves 230 over the surface of the first portion 212 thus attaching the base plate 204 to the utility bracket 206. Once the base plate 204 is received through the receiving hole 210, the utility bracket 206 can swivel about the swivel button 226.

Referring now to FIGURE 20, the first surface 220 of the base plate 204 includes one or more posts 240. The posts 240 are sized to provide a gap between the base plate 204 and a support structure (not shown), such that an optimum amount of adhesive is maintained

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between the base plate 204 and the support structure. It will be appreciated that the base plate 204 can be formed of metal, an injection-molded plastic, polymer, polycarbonate, or some other similar semi-rigid material.

Referring now to FIGURE 21, when the bracket system 200 is used, two axes of rotation allow aligning of wire bundles or other devices connected to the bracket system 200. The first axis of rotation is about a nut plate 260 that attaches to the bracket 206 through one of the thru-holes 216. The second axis of rotation is about the swivel button 226.

It will be appreciated that the brackets shown in FIGURES 4-21 may be produced by a various number of manufacturing techniques, such as without limitation, extruding, stamping, or molding performed on various materials, such as without limitation, various metals, alloys, plastics, or polycarbonates.

While the preferred embodiment of the invention has been illustrated and described, as noted above, many changes can be made without departing from the spirit and scope of the invention. Accordingly, the scope of the invention is not limited by the disclosure of the preferred embodiment. Instead, the invention should be determined entirely by reference to the claims that follow.

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